Using the COM-B model of behaviour to understand sitting behaviour in U.K. office workers

Using the COM-B Model of Behaviour to Understand Sitting Behaviour in U.K. Office Workers.

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Abstract

Prolonged sedentary behaviour has established health risks; however many individuals spend long periods of time sitting at work. Qualitative researchers suggest that inconsistent effectiveness of interventions may be linked to an incomplete understanding of the nature of and factors influencing sedentary behaviour in the workplace. Therefore, this study's aim was to use the COM-B model of behaviour, complimented by the Theoretical Domains Framework, to examine how Capability, Opportunity and Motivation influences sitting behaviour at work in office workers. The study was a qualitative phenomenological analysis in which office workers (n=10) who had predominantly desk-based jobs were interviewed about their sitting behaviour at work. Interview analysis using the Nvivo 10 programme and the Framework Method identified themes and quantified the prevalence of each theme across participants. The analysis incorporated a number of procedures to enhance the trustworthiness including researcher reflexive journal and coding triangulation. Physical capability had minimal influence on behaviour, but psychological capability was influential. Physical and social opportunities were influential in terms of the physical environment, nature of the job, social acceptability and norms related to sitting. Both automatic and reflective motivation emerged as being influential on sitting behaviour. To conclude, the COM-B model, complimented by the Theoretical Domains Framework (TDF), facilitated understanding of factors influencing office workers' sitting behaviour and highlighted a number of potential areas for future intervention foci.

Key Words: Sedentary, Sitting, Office workers, Workplace, COM-B,

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Sedentary behaviour is defined as any waking behaviour characterised by an energy expenditure of ≤1.5 Metabolic Equivalents (METs), whilst in a sitting or reclining posture (Sedentary Behaviour Research Network, 2012). Accumulating evidence indicates that sedentary behaviour is strongly associated with an increased risk of cardiovascular disease, type 2 diabetes, metabolic syndrome, some cancers and all-cause mortality (van der Berg et al., 2016; de Rezende, Lopes, Rey-López, Matsudo, & do Carmo Luiz, 2014). Despite these health consequences, there is considerable evidence that adults spend a large proportion of their day being sedentary (Bennie et al., 2013). Office workers can spend up to 9 hours sitting and have been identified as at particular risk of the health implications of sedentary behaviour (Clemes, Patel, Mahon, & Griffiths, 2014). Consequently, Public Health England and a UK community interest company (Active Working CIC) invited an international group of experts to provide guidelines for employers to promote the avoidance of prolonged periods of sedentary work (Buckley et al., 2015).

Several reviews have examined the effectiveness of interventions aimed at reducing sitting time in workplaces (MacEwen, MacDonald, & Burr, 2015; Shrestha, Ijaz, Kukkonen-Harjula, Kumar, & Nwankwo, 2015; Tew, Posso, Arundel, & McDaid, 2015). Nevertheless, these reviews have drawn limited conclusions due to the low quality of studies. For example, a recent Cochrane review highlighted that although interventions have been promising, there is a need to enhance methodological rigour (Chu et al., 2016). Furthermore, recent qualitative research suggests that inconsistent intervention effectiveness may be linked to an incomplete understanding of the nature of and factors influencing sedentary behaviour in the workplace (Cole, Tully, & Cupples, 2015; Hadgraft et al., 2016).

Michie, Van Stralen and West (2011) argued that the process of designing behaviour change interventions should begin with an understanding of the nature of the behaviour to be changed. In addition, Michie, Van Stralen and West were also cognisant of the many published overlapping psychological theories of behaviour change. Michie et al. aimed to produce a simplified model that may be applicable to behaviour change. The resultant COM-B model incorporates three factors that influence behaviour (B): Capability (C) defined as the individual's psychological and physical capacity to engage in the behaviour; Opportunity (O) defined as physical and social factors that lie outside the individual and make the behaviour possible or prompt it; and Motivation (M) defined as all those brain processes that energise and direct behaviour, including automatic and reflective processes (see Michie et al.). The complementary Theoretical Domains Framework (TDF), which is an integrative framework of behaviour change theories (French et al., 2012), can be used to provide further insight into the processes underpinning each of the COM-B constructs (Cane, O'Connor, & Michie, 2012). For example, psychological capability within COM-B incorporates several TDF constructs including knowledge and behavioural regulation. In relation to intervention design, a particular benefit of using the COM-B model is that it is integrated within the larger Behaviour Change Wheel (BCW), which directly maps the individual components of the COM-B model with particular relevant intervention functions, and policy categories (Michie, Atkins, & West, 2014).

COM-B and TDF have been used to examine behaviour and inform intervention development in a number of health behaviours (e.g. Barker, Atkins, & de Lusignan, 2016), but have only recently been applied to sedentary behaviour (e.g., Spence, Rhodes, & Carson, 2016). Therefore, the aim of this study was to use the COM-B framework, complemented with the TDF, to explore how capability, opportunity and motivation influence sitting

behaviour in the workplace in order to identify promising avenues for intervention with reference to the BCW.

Method

Epistemological perspective

In the interest of providing an in-depth exploration of sitting behaviour, a qualitative research paradigm using one to one semi-structured interviews was used. Phenomenology, more specifically, interpretative phenomenological analysis (IPA) guided the process as the participants' experience of the phenomena (sitting in the office) was the primary interest to explore (Eatough & Smith, 2017).

Participants

Employees who had a predominantly desk-based job in an urban Scottish office environment were invited to take part in the study. A primary contact within the company was identified and adopted the role of gatekeeper. This person had the role of managing director of the company and therefore had access to all employees across all departments. The gatekeeper granted and facilitated the initial communications and supplied the contact email addresses of all employees. Employees were subsequently contacted directly by the principal investigator through this medium. The principal investigator visited the office in person to explain the purpose of the study and to facilitate further recruitment. At the end of this process, ten volunteer participants (7 Female, 3 Male; aged 26-55) who self-reported sitting an average of 9.35hours (SD 1.83) per day gave informed consent, and took part in the study.

Instruments

The interview guide was developed and informed by the components of COM-B (Michie et al., 2011). Participants were first asked general questions about their sitting behaviour at work followed by three sections of questions targeting factors that influence their sitting behaviour with reference to capability, opportunity and motivation. The interview topic guide was piloted and minimal subsequent changes were made.

Procedure

Following institutional ethical approval and provision of informed consent, the participants were interviewed in their place of work during standard working hours. Interviews lasted approximately 37 minutes (SD 3.2) and were digitally recorded on a secure device before being transcribed verbatim and anonymised. The interviews may appear short in length when perceived on numeric value alone; nevertheless the interview data was rich with participant's freely speaking of their experiences of sitting in the office. The participants' candour highlights that the very specific topic can produce meaningful discussions easily, as most people enact sitting behaviours frequently.

Data Analysis

Analysis of the data was performed following the Framework Method of analysis, which has become increasingly evident in health research (Gale, Heath, Cameron, Rashid, & Redwood, 2013). Framework analysis sits within a wider family of thematic analytical methods (Braun & Clarke, 2006; Gale et al., 2013; Srivastava & Thomson, 2009). The overall purpose of the Framework Method is to identify themes evident in the data and produce a matrix which reduces the data and facilitates exploration of "divergence" and "convergence" (Eatough et al., 2017) within and between participants, which researchers using IPA also seek to explore (Eatough et al 2017., Gale et al.,2013). Producing framework

matrices includes summarising or charting the coded data from the transcripts. Summarised data should retain meaning of coded data and include references (line numbers) to illustrative quotes within the transcripts (Gale et al., 2013). Initially, the primary researcher familiarised himself with the interviews by listening to the recordings and noting observations in a reflexivity journal. Using NVivo 10, the first two transcripts were open coded line-by-line. Each code was given a descriptive label and this label was then expanded with reference to the COM-B model and the TDF. For example, the coding label of 'lack of understanding of health risks of sedentary behaviour' was named 'Capability-Psychological-knowledge-lack of understanding of health risks of sedentary behaviour'. Codes with similar labels were clustered together to create initial emergent themes and a preliminary analytical framework. These emergent themes were further clustered together to form the higher order themes that are presented. The analytical framework was applied to each transcript in turn. The data were charted into framework matrices and analysed to identify the frequency of themes across participants. The analysis incorporated a number of procedures to enhance the trustworthiness including a researcher reflexive journal and coding triangulation (Mason, 2002; Tong, Sainsbury, & Craig, 2007).

Results

A framework matrix for capability, opportunity and motivation are included as supplementary material and illustrates the frequency of each sub-theme across participants. Figure 1 shows the emergent findings organised around the COM-B framework, and illustrates the higher order themes that emerged as being influential on sitting behaviour in this group of UK office workers. Figure 1 shows the number of participants who referred to each higher order theme.

Capability

In relation to the COM-B component of 'physical capability' the higher order theme titled Physically Capable of Reducing Sitting Time at Work emerged with most participants (n=9) reporting that they felt they possessed the physical means to sit less. For example, Participant 1 reported,

> I sometimes go down the stairs and say hi to the guys and also I go get the supplies from down stairs. We keep all the paper and stationary down stairs so, when we run out of paper, I go down there and back up the stair.

There was only one respondent who reported that a "dodgy hip" impacted on ability to reduce sitting time at work.

Three higher order-themes emerged relating to the COM-B component of psychological capability. Firstly, nine of the participants indicated a lack of knowledge about the adverse health risks associated with prolonged sitting time. For example, when participants were asked if they thought sitting time might be affecting their health, Participant 8 responded, "Never. Never. No and I didn't actually realise I actually sat so long until you asked (laughter)". Additionally, Participant 7 reported, "I don't think I thought that sitting always was affecting my health". In the second higher order-theme participants (n=9) also reported that pressure to complete work influenced their behaviour. Specifically, indicating that job demands caused pressure to focus on work, influencing ability to both minimise and break up sitting time. This experience was illustrated by Participant 6 who stated, "Once I get the information through from the other branches, it's sort of head down and there is not much time then to get up and wander about because that is sitting and you need to concentrate and you need to get the information through". Further, Participant 7 reported, "You are at your desk, 5 emails to reply to and your phone is going and you've got to get things sent off to a client and everything is against the time". The third higher order theme

relating to psychological capability emerged from participants' (n=7) awareness of the mental benefits of breaking up sitting. Specifically, participants reported that they broke up their sitting to mentally refresh and improve their ability to work efficiently. For example, Participant 9 reported,

> I will always, rather than just scanning the document up to payroll on top floor, I will take it up for them, gets you away from your desk and I use that time to clear my head also sometimes. You are sitting at your desk and you cannot think straight, 5 minutes up and down the stairs just to clear your mind and I do that quite often but when I go up the stairs I can take the time to go… ok! I know I will do that, then I will do that, and you have a clearer picture again of what the plan is going to be.

Participant 8 also commented, "There are times that I would say I'm going to go out for 5 minutes just for a breath of fresh air and just come back, when it gets a bit stifled". These examples highlight that, for some office workers, switching off to take a break to refresh resulted in the positive indirect effect of reducing sitting time.

Opportunity

The COM-B component Physical Opportunity included two higher order themes - Job Characteristics and Office Environment. The higher order theme of Job Characteristics emerged from all participants (n=10) commenting that their reliance on their computers and phones to complete their work was a major reason why they could not currently reduce their sitting time. For example, Participant 2 responded,

> I just have to get on with the job at hand and keep writing and contact people through email and because so much of it is at the desk. I am not sure what ways I could (reduce sitting)? I couldn't do it; unless I had the option of maybe taking a laptop and could sit in a café rather than just sitting at the desk for so many hours during the day.

Participant 9 also highlighted: “It’s all computer based and on the phone stuff like that”. The higher order theme of Office Environment emerged from all participants (n=10) commenting that the physical characteristics of the office environment influenced their behaviour. In this sample, the office environment was spread across different floors with central office amenities and this had a positive influence on sitting behaviour. For example, Participant 4 and Participant 1 explained “Well obviously the other office is downstairs and the interview room”, and “So at the moment I go to the drinks machine or I might go to the printer”, respectively.

The COM-B component Social Opportunity included two higher order themes. Firstly, the higher order theme of Social Acceptability emerged because participants (n=10) reported that management and other co-workers were accepting of behaviours that reduced sitting. For example, Participant 7 reported,

> I think they (management) appreciate that it’s quite a busy job and it’s quite a stressful job. Obviously we are not a young crowd in here emm… so things that would improve your health so if you are off because of your bad health like a bad back or anything that is going to be an effect on the company so anything that is going to affect or help improve health or possibly reduce the absence due to illness or due to that I think they would be quite good. The management here are quite forward thinking in that respect.

Additionally participant 2 reported, “Oh yes if I’m kind of brain dead and need a break I’ll go to the shop and come back. There is no problem like that”. Participant 6 highlighted that there was a culture of worker autonomy in their office, which suggested it would be acceptable to move from his desk: “In this particular company you don't feel like their eyes are on you … someone’s not going to come in and say, why are you not at your desk?”. The second higher order theme was labelled Norm to Sit and clustered participants’ (n=4) explanations that their

current sitting behaviour was related to the context of what was considered to be socially normal behaviour within the office. For example, participant 4 reported,

> I could have maybe more interactions with my boss who, if she was at the other side of the room then we would have to go to the other side of the room to speak to each other…But with that… it's not realistically we cannot be more physically active because I am sitting and typing and it is through the computer so I do need to be at my desk so standing at my desk would feel a little bit odd. Maybe an hour a day I could do it or maybe 20 minutes or 15 or an hour over the course of a day but it would feel kind of odd.

Also, participant 3 reported, "This (sitting) is the normal and you need to do the same".

Motivation

The COM-B component of Automatic Motivation included one higher order theme, which was Sitting as a Habit. All ten participants made comments that were related to their sitting behaviour being habitual. For example, Participant 8 reported,

> I suppose your question is a matter of habit…in some ways I imagine with human nature we want to implement these things but it becomes easy to get back into the easiness and convenience of sitting down during the day and continuing with what you have done before… we would need to actually build in good habits to put these things in place.

Also participant 9 reported, "It's habit formed and you learn to sit in your seat". Three higher order themes emerged within the COM-B component of Reflective Motivation. The higher order theme Beliefs About Consequences of Behaviour of sitting emerged because some participants (n=2) reported that they believed there would be negative consequences if they reduced their sitting. These consequences included beliefs that reducing sitting would impact on their work efficiency as illustrated by Participant 3 who stated,

> Well a pet hate of mine is to leave a job unfinished. I would much rather sit and get it all done and take my break and I can start fresh on a new task and I would hate to know that I had to take a break and I was leaving a big mess and going away all stressed out and coming back thinking …where was I there?.....get it finished!

Additionally, participant 1 stated, 'I would feel like I'm losing time." Participant 5 highlighted that they may experience disapproval from their line manager if they reduced sitting: 'Whether my editor and boss would be happy with me getting up, I'm not sure". A second higher order theme was labelled Lack of Intention to Reduce Sitting to reflect that some participants (n=4) had no intention to reduce their sitting. For example, Participant 8 commented, "It seems easier sitting, you become lazy and want to do these things". Participants also expressed internal belief in their capability to engage in the behaviour with four participants commenting on this and contributing to the third higher order theme Belief about Capability to Reduce Sitting (n=4). Participant 6 commented "There is definitely ways if you apply yourself, there are definitely ways you could sit less." Participant 3 highlighted, "I do want to get up and move".

Discussion

The purpose of this study was to use the COM-B model complemented by the TDF framework to explore influences on sitting behaviour in the workplace (Michie et al., 2014). As the COM-B model sits within the BCW, we can extend one step further and use the intervention functions and policy categories of the wheel to identify avenues for future interventions (Michie et al., 2014).

In relation to Capability, it was evident for this sample that psychological capability was more of a barrier to changing sitting behaviour than physical capability, which was only mentioned by one participant. Specifically, lack of knowledge about the risks of sitting was

consistently reported by the participants, which is consistent with other qualitative studies (De Cocker et al., 2015). The results point to an apparent barrier within psychological capability and the BCW would suggest targeting education may be an important component of any intervention in SB in office workers (Michie et al., 2014). Indeed, previous interventions that have included educational components have decreased SB in the workplace (Chu et al., 2016) and included strategies such as healthy lifestyle counselling sessions (see Verweij, Proper, Weel, Hulshof, & van Mechelen, 2012). Participants also highlighted that pressure to complete work influenced their ability to reduce their sitting time, and suggests that participants perceived sitting was associated with working. Future research should consider challenging these perceptions by introducing workers to alternative ways of working, such as standing during meetings or walking to a printer or photocopier. It was encouraging that most of the participants recognised the benefits of breaking up sitting to provide a "mental break" from their work and enhance work productivity. It would be valuable to further explore the nature of the relationship between a "mental break", productivity and sitting behaviour to encourage behaviour change, as workers and employers are more likely to engage in a behaviour they feel will be beneficial (cf. Cole et al., 2015).

In relation to the role of Opportunity, it was evident that both physical and social opportunities emerged as important influences on sitting behaviour in this sample. In terms of physical opportunity, the characteristics of the participants' job required them to have access to a computer and phone, and this was very influential on their sitting behaviour. Participants reported that they needed to be at their desk in order to carry out their job, and this limited opportunities for reducing sitting. Applying the BCW, it is evident that environmental restructuring could be used to address this barrier. Many interventions focus on the environmental aspect of the office by introducing activity permissive workstations. Although activity permissive workstations can be effective, there are cost implications that may make

this prohibitive (Hadgraft et al., 2016) and alternative organisational level strategies, such as using team leaders as role models for behaviour change, may be more feasible both in terms of cost effectiveness and deliverability (Hadgraft et al.; Healy et al., 2016; Michie et al., 2014). All participants recognised that aspects of their office environment were conducive to reducing sitting time, as their office was spread over different floors and include shared resources (e.g., printers). This finding aligns with other recent qualitative work (Cole et al., 2015) and highlights how the physical environment can influence behaviour, reinforcing how changes to the physical environment may offer an appropriate intervention strategy to positively influence sitting behaviour (e.g., De Cocker et al., 2015; Hadgraft et al., 2016).

In the present sample, the social environment was viewed as being supportive of breaking up sitting because the management style was relaxed. Although there was limited evidence that the managers were promoting reduced sitting, they did support autonomy amongst the workers that allowed them to manage and break up their work, and therefore break up time spent sitting. It is likely that the management style will vary from office to office, and this finding supports Cole et al.'s conclusion that interventions for reducing sedentary behaviour will likely need to be tailored to individual offices (Cole et al., 2015). Despite reporting that they were in a work environment that supported autonomy, some participants recognised that sitting was very much the norm in their office and this encouraged them to sit. This finding is consistent with other qualitative studies (Cole et al.; Hadgraft et al., 2016), and indicates that interventions may need to challenge current norms and target the social culture of the office in order to be effective. Although cultural norms are often deeply rooted within individuals and groups (Schein, 1990), researchers applying the BCW found, that there might be potential to challenge norms through incentivisation (e.g. rewards for active meetings) and guideline changes (e.g. targets for employee sitting time) (Verweij et al., 2012; Michie et al., 2014).

In terms of Motivation, there was evidence that both automatic and reflective motivation influenced sitting behaviour in this group. Habit is a form of automatic motivation, and all ten participants recognised that their sitting behaviour was habit based (i.e. learned behaviour triggered by environmental cues with limited cognitive influence (Gardner, 2015)). This finding aligns with other opinions and studies in which researchers considered sitting behaviour from the perspective of habit (see Biddle, 2015; Conroy, Maher, Elavsky, Hyde, & Doerksen, 2013; Hadgraft et al., 2016; Kremers & Brug, 2008). Based on the finding that sitting is a habitual behaviour, the BCW highlights that interventions designed to reduce sitting should focus on breaking the habit through strategies such as environmental restructuring as well as prompts to break habit by substituting alternative behaviours (Michie et al., 2014; Pedersen, Cooley, & Mainsbridge, 2014).

Although sitting does appear to be heavily influenced by automatic processes, there was evidence from this study that more reflective processes also had a role. Specifically, participants reported a number of beliefs about the consequences of reducing sitting. Unfortunately, these beliefs were mainly that reducing sitting would lead to negative consequences, including reduced work efficiency and disapproval from others. This finding contradicts the autonomous social environment described by participants and show that participants may have deep rooted beliefs about working behaviours associated with positive work performance. Interventions could aim to challenge these beliefs, perhaps by linking to perceptions about the benefits of reducing sitting to have a ‘mental break’, as discussed above. Such an intervention may also be useful in encouraging workers to consider reducing their sitting, because it was evident in this study that some participants had no intention to change their sitting behaviour. Finally, there were mixed responses from participants regarding belief in their capability to change their behaviour. For individuals who did not hold belief in their capability to reduce sitting, the BCW highlights that an intervention could

target building self-efficacy for behaviour change through strategies such as goal setting and role modelling (Michie et al., 2014).

In conclusion, the findings of this study demonstrate that the COM-B model used in conjunction with TDF can provide a useful framework for understanding sitting behaviour in office workers. From the findings, it is evident that capability, opportunity and motivation all influence sitting behaviour at work therefore would be important to consider if designing an intervention for this workplace. Seven higher order themes were identified by at least 9 of the participants; physically capable of reducing sitting time (n=9); lack of knowledge (n=9); pressure to complete work (n=10), sitting as a habit (n=10), job demands (n=10), office environment (n=10) and social acceptability (n=10) and these findings provide some direction in terms of prioritising intervention foci. For example, drawing on the BCW (Michie et al., 2011), it could be suggested that interventions could target lack of knowledge by developing behaviour change approaches which specifically target building knowledge of the health risks of sitting and associated benefits of reducing SB. To the authors' knowledge, this is the first study that has used the COM-B model framework in order to understand sedentary behaviour in the workplace. By using IPA to explore sitting behaviour as experienced by office workers in their working environment we have added to the literature and provide direction for future interventions. Nevertheless, it is recognised individual office settings' social and physical environment will most likely influence perceptions of sitting behaviour, and this contextual factor should be considered when interpreting these findings. This strengthens Michie and colleagues' argument for performing a behavioural analysis prior to intervention design (Michie et al., 2014). Also, the findings may have been influenced by the recruitment strategy and it should be acknowledged that the gatekeeper, who had management role in the company, may have influenced participants. The findings

are also limited by the small sample size and the focus on one work environment. Future research should seek to explore these findings in relation to other settings.

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Figure 1: Emergent higher order themes within the COM-B model with participant quotes.